

Test and Comparison of Stripixel and Strip sensors for NCC

The photo of the test setup is here

http://www.phenix.bnl.gov/~suhanov/ncc/tests/fem_src_2sensors.jpg

The Stripixel sensor (dark brown) was C2 from our EWAH collaborators (see IV curve below). The strip sensor – 10-years old from our MSU collaborators.

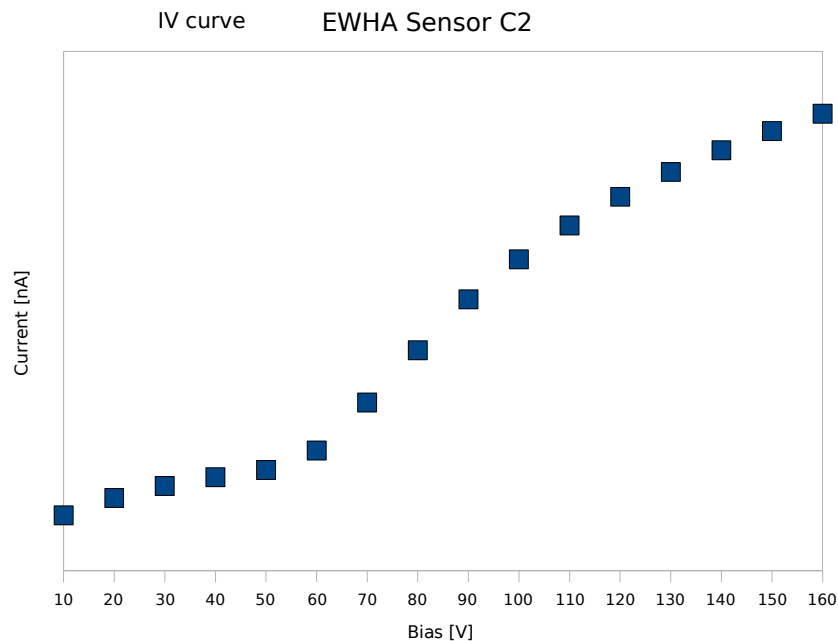


Illustration 1: IV curve of the stripixel sensors.

Test With External Calibration Pulse

The internal injecting capacitor is 25fF, the CalStrobe voltage reference, as I remember was 0.8V. The injecting charge is of the order of 20 fC.

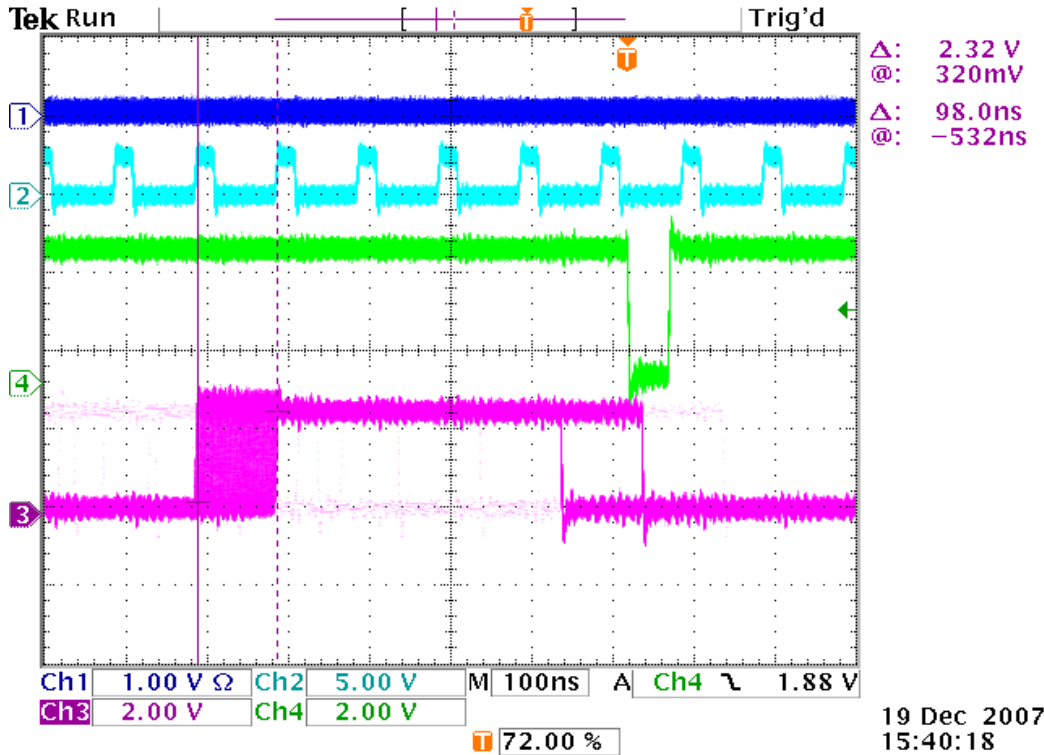


Fig 1: FEClk, L1A and CalStrobe timing

It is quite tricky to use SVX4-based readout electronics for non-synchronized triggers; to address this issue we measured for each event the time of arrival of the external trigger with precision of 1/8 of the clock period. We used this phase position offline for selecting the signals with proper timing.

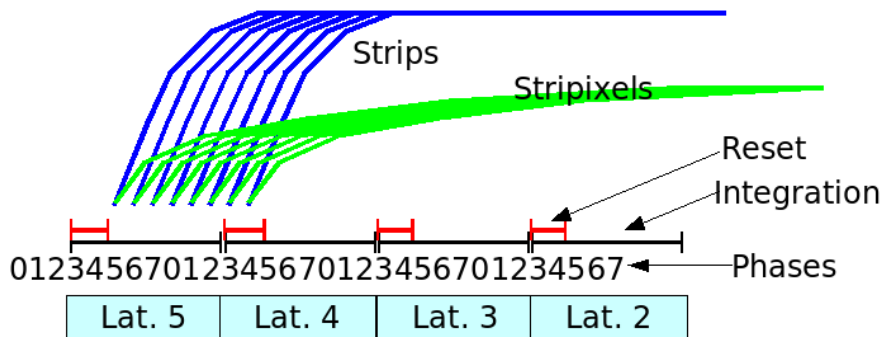


Fig 2: Relation between phases, clocks, latency and test responses of strip and stripixel detectors to applied CalStrobe. Clock period is 100ns.

What we see, the signals from the strips are short - less than a half of the clock period; the signals from stripixels are rather long – they span for 4 clocks.

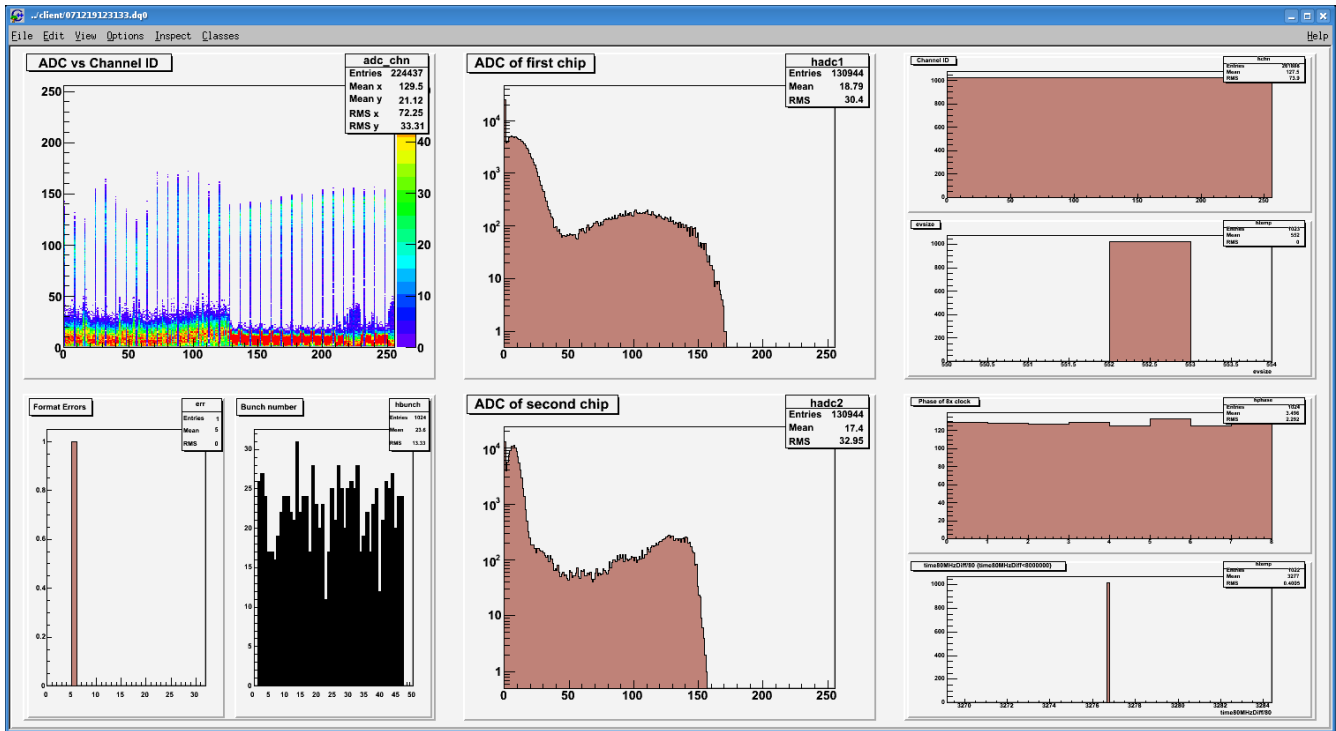


Fig 3: ADC vs channel number in left upper corner. Channels 0:127 connected to stripixel sensors, channels 128:257 - to strip sensors.

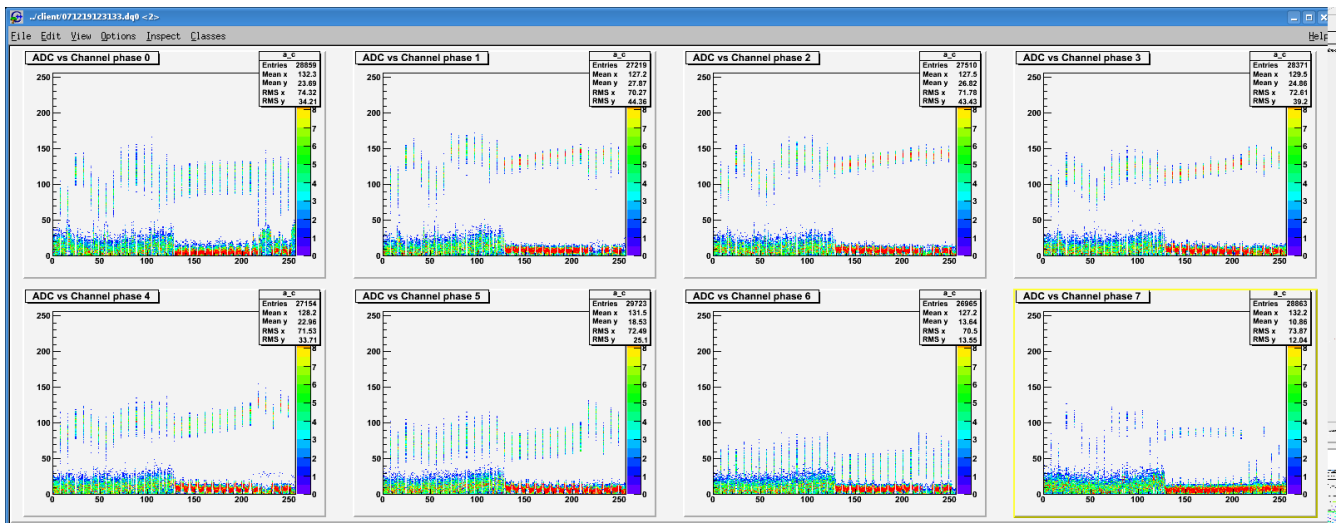


Fig 4: ADC vs channels when signal arrives in different phases of the clock. Each histogram corresponds to one of 1/8 of the clock. Trigger Latency = 5.

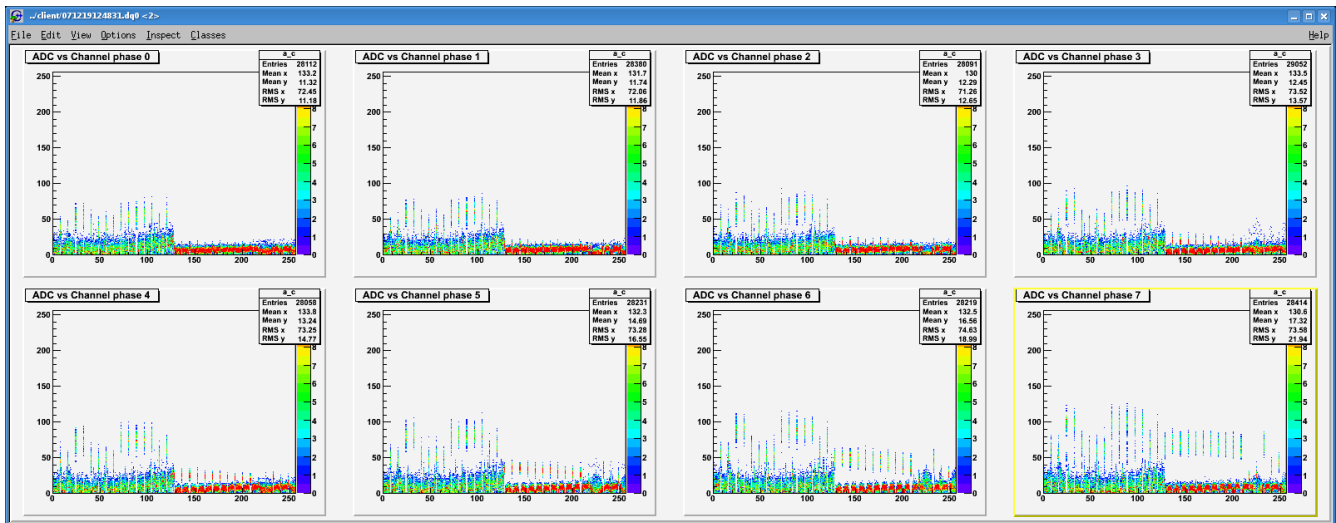


Fig 5: The same picture for trigger latency 4. The strip signals disappeared while stripixels are still significant. The stripixel signals disappear only at latency 1.

We can conclude that the stripixel sensors have much larger capacitance than the strip sensors. More significant effect was found when we changed the rise time of the preamplifier to maximum (it was minimal before). The signals from the strips were clearly visible but signals from stripixels were almost unnoticeable.

These test results contradicts with the preliminary report of Jik Lee on August 6, 2007 where they have measured the similar sensors using the same beta source. They had three stripixel lines (two non-neighboring Y and one X) connected to MMRP1 preamp of mesystec(from www.mesytec.com, parameters unknown) and to 65 MSPS ADC (The ADC conversion factor is 1V/4096). The one of the events is shown at

http://www.phenix.bnl.gov/~suhanov/ncc/tests/event_0.pdf

The ch1 is the backside(n-side), ch2 is x6, ch3 is y3, ch4 is y5 tripixels. The horizotal axis is time (64micorsec = 4096bins*15.625ns).

Run With The Beta Source

The collimated source (Sr 90) was placed in front of stripixel detector. The 0.5mm thin scintillator (read by two PMs from both ends) was placed between source and the sensor.

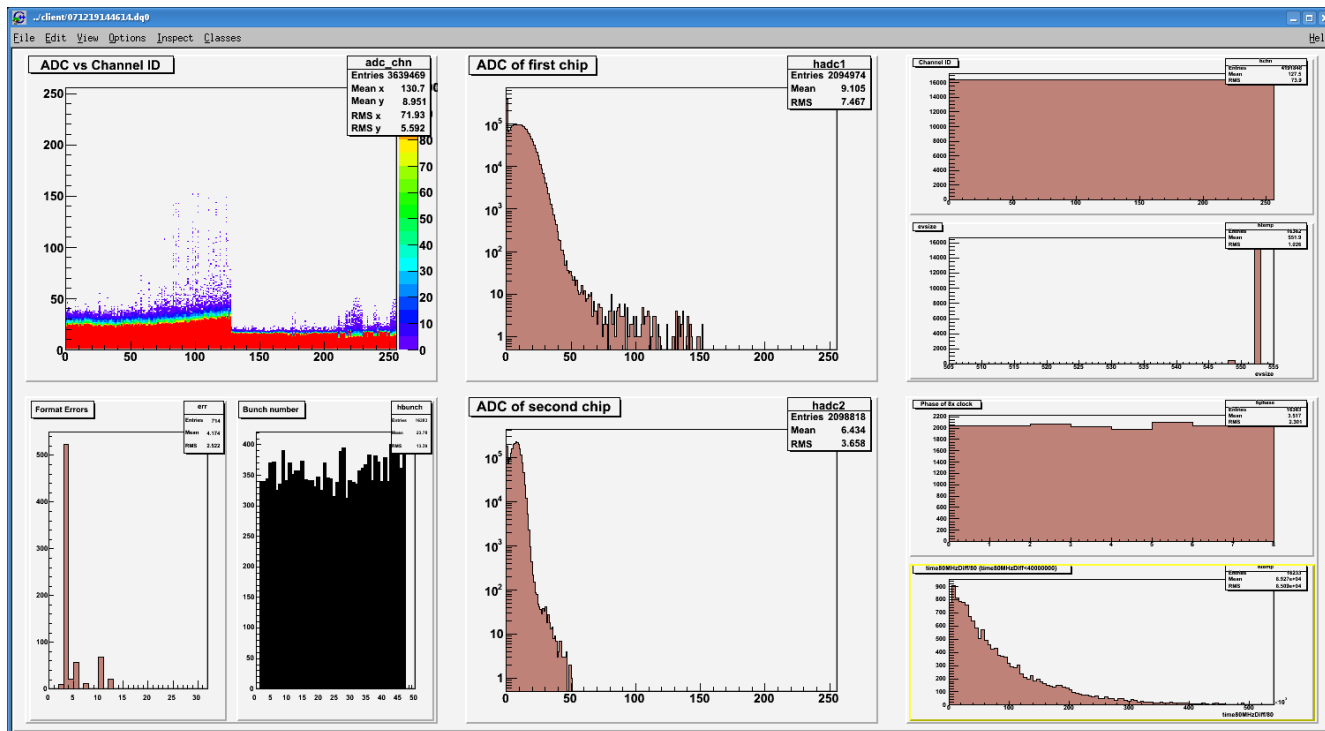


Fig 6: Bias 70V, 900 nA. 16K events. The time difference between events is nicely Poissonian. No traces of beta particles.

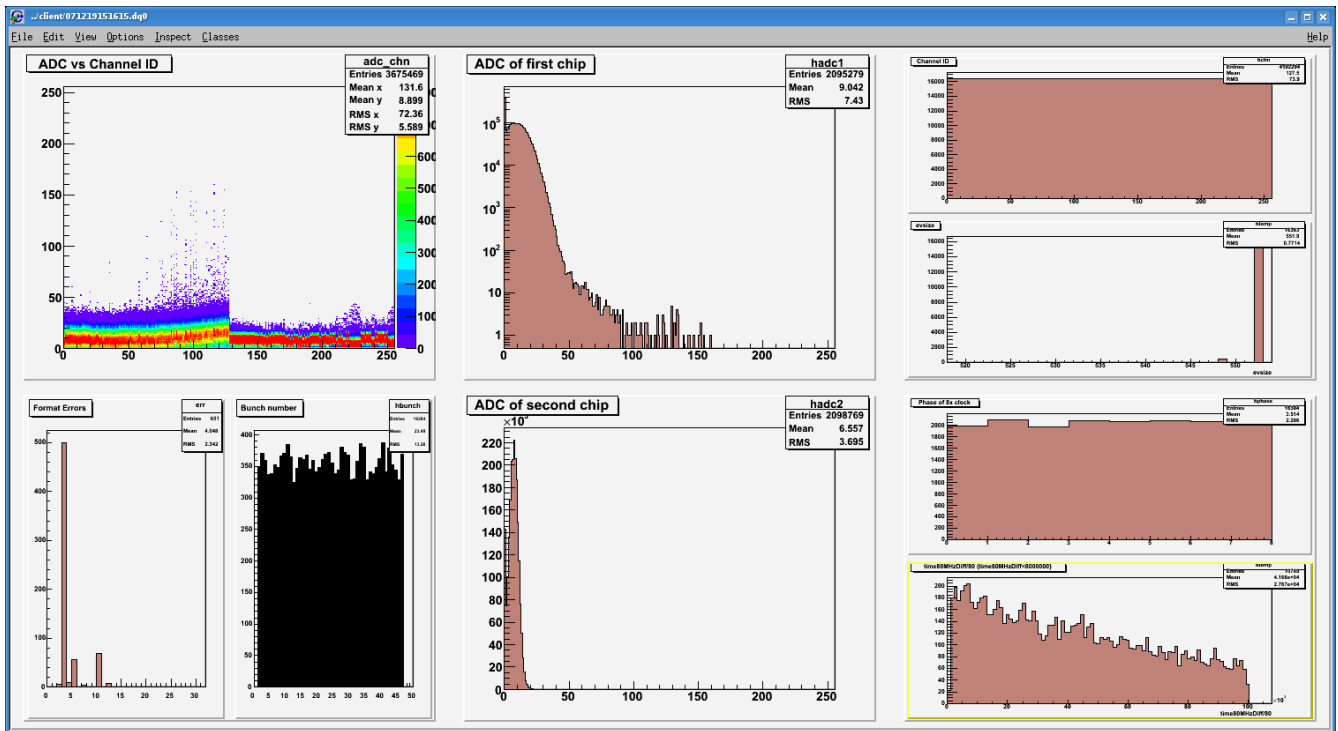


Fig 7: Bias 160V, 24uA. 16k beta triggers.

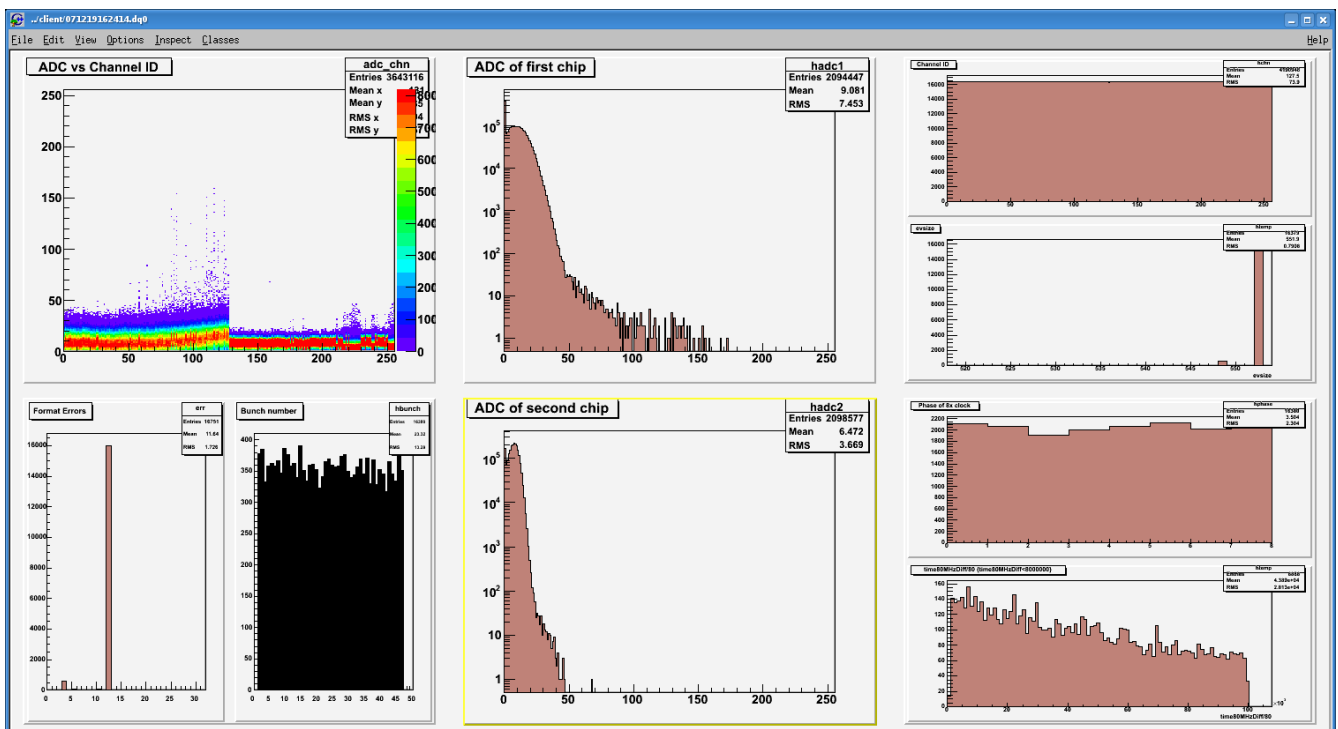


Fig 8: For reference, Bias 70V 1uA. Beta source removed, random trigger from photomultiplier noise.

There is no traces of the beta particles in stripixel sensors.